

a. Scale of Plct Plans

Site Size: less than 10 acres	1 inch = 50 feet
10 to 100 acres	1 inch = 100 feet
over 100 acres	1 inch = 200 feet

b. Contours

Show existing and proposed contours at 5-foot intervals. If existing and proposed contours are superimposed upon one another it must be clear as to which is which. Plans which incorporate a screening process may be required by the County to distinguish said contours.

Finished contours must show how the property can be used under the existing zoning. Plans showing daylighting of property to road grade or below with high 2:1 slope walls will no longer be permitted within the R, S, or G zones. The plans must contain large terraces which will permit the lot sizes and roads that are permitted within the zone.

c. Sections

Show a minimum of two sections in each direction.

d. Maximum Slope

Cuts shall not be steeper in slope than two horizontal to one vertical unless the owner furnishes a soils engineering or an engineering geology report certifying that the site has been investigated and indicating that the proposed deviation will not endanger any private property or result in the deposition of debris on any public way or interfere with any existing drainage course.

e. Fill Slopes

No fill shall be made which creates an exposed surface steeper in slope than two horizontal to one vertical.

f. Benches on Slopes

There shall be a 10 foot wide bench sloped into the hillside for every 50 feet in height.

g. Setbacks

Material and vegetation shall be left in its natural state:

50 feet from any FP, A, G, S, or R zoned property:

20 foot setback which includes a 6 foot high planted berm along any public right-of-way;

20 feet from M, B, or CG zoned property;

10 feet from QM or FR zoned property.

Plans shall show type of vegetation existing within the buffer zones.

h. Drainage

All drainage facilities shall be designed to carry surface waters to the nearest practical street, storm drain, or natural water-course. Adequate provision shall be made to prevent any surface waters from damaging the face of an excavation or fill. All slopes shall be protected from surface water runoff from above by berms or swales.

The Contractor is further advised that King County may require conditions which are in addition to the foregoing list and that the County may reject permit applications at its discretion because of the proposed operations proximity to schools, residential neighborhoods, hospitals, arterials or for other environmental conditions.

When there are discrepancies between the requirements of the State and the County the more stringent specifications shall apply.

Should the Contractor fail to comply with any requirements of a temporary permit obtained in the State's name, the State will take the necessary action to meet these requirements and any costs incurred by the State will be deducted from monies due or to become due the Contractor.

TEST HOLE DATA
(November 2, 1981)

The attached log of test boring sheets are reproductions of the original log of Test Boring for the test holes indicated on the *** Layout Sheets *** of the plans.

CONCRETE PONTOONS

Part 1 General Description

1.01 Description

- A. This item of work consists of pontoon construction, pontoon repairs, launching, prestressing, bolting and prestressing the joints between the pontoons, mooring and moving of pontoons, joining, gravel ballasting, and other miscellaneous accessories attached and considered as permanent or temporary part of the pontoon in accordance with the requirements of

the standard specifications, the plans and these special provisions.

1.02 Quality Assurance

A. Concrete Tolerances

1. Slab and wall thickness; plus 1/8 inch, minus 0.0 inch.
2. Overall cross-sectional dimensions, i.e., distance between centerlines of walls, bulkheads, top and bottom slabs, location of columns, overall length of pontoon after post-tensioning; plus or minus 1 inch.
3. Skew of pontoon; 1/2 inch across end section.
4. Tendon duct placement; plus or minus 1/4 inch.
5. Cover over reinforcing steel; plus 3/8 inch, minus 0.0 inch.
6. Location of sleeves, openings, inserts; plus or minus 1/2 inch.
7. Alignment of pontoons; plus or minus one inch in 500 feet unless otherwise shown or noted.

B. Pontoon Bolted Joints

1. The bolts shall be reasonably straight.
2. The warpage or deviation of the bolt axis from a straight line shall not exceed 1/16 inch for each foot of overall length of bolt.
3. The deviation of the axis in the last foot at either end of the bolt from a straight line through the main body of the bolt shall not be greater than 1/8 inch.
4. At the Contractor's option the bolt head may be deleted and the bolt threaded and nuts and washers furnished at both ends.

C. Cable Saddle, Chafing Ring and Port Lining

1. Each casting shall be completely subjected to the magnetic particle inspection and acceptance in accordance with ASTM A 27, Section 13.
2. Each casting shall be marked in accordance with ASTM A 27, Section 17.

D. Cable Crosshead Castings

1. Each casting shall be completely subjected to magnetic particle inspection in accordance with ASTM A 486 Supplementary Requirements Section S2.
2. The standards of acceptability and methods of inspection shall be as listed in Reference Photographs ASTM E125 and ASTM Methods E 138, Wet Magnetic Particle Inspection.
 - a. Castings showing injurious defects as judged by ASTM E 125 shall be rejected or repaired with the approval of the Engineer.
3. Each casting shall be marked in accordance with ASTM A 486, Section 11.

E. Pump Hatch Frames And Covers

The Contractor shall submit certification from the manufacturer that the material has been sampled, tested and inspected in accordance with ASTM A 48.

1.03 Submittals.

- A. The Contractor shall submit shop drawings and calculations for the anchorage assembly, the watertight doors, the cable adjustment devices, joining of pontoons, including duct and pipe sleeve plugs, concrete and grout mix design, steel reinforcing bar splices not shown on plans and schedules as required by the various articles of these specifications, and as requested by the Engineer, to the Engineer for review.
- B. Prior to commencing work on the construction of the pontoons, the Contractor shall submit his plans and schedule for the work, including full data on the site or sites chosen for fabrication of the pontoons, post-tensioning calculations and sequence; method of launching and holding before transport, towing arrangements, method of towing, joining, listing of equipment to be used, weather interruption precautions, and storage and staging areas to the Engineer for review.
- C. The Contractor shall submit detailed shop drawings showing proposed method of construction for the Engineer's review.
 1. Submittal shall include drawings indicating extent of precast and construction methods proposed; location of construction joints, pour schedules, method of treating construction joints, post-tensioning and reinforcing shop drawings, and formwork design and drawings.

- a. Prior to developing the details of his plan, the Contractor shall prepare preliminary details showing method of construction and submit to the Engineer for review.

D. Prior to superstructure construction on pontoons, the Contractor shall submit the proposed site and sequence of superstructure construction to the Engineer for review. Included in the proposal shall be stability calculations, by a Naval Architect, and structural calculations by a licensed professional engineer, licensed under the provisions of Title 18 RCW with the State of Washington and shall bear his signature and seal, covering all phases of this work.

E. The Contractor shall submit details of the proposed forms tie system and calculations to the Engineer for review.

1.04 Handling and Storage

A. Reinforcing Steel

1. The Contractor shall provide all additional reinforcing steel or inserts as may be required for handling of the precast elements. All inserts shall be stainless steel ASTM A 276 Type 303 or 304.

B. Post-tensioning Storage

1. Tendon assemblies, ducts, anchor plates, strands, bars, and trumpets, shall be stored in a weather tight building with either control of relative humidity to 20 percent or use of an approved corrosion inhibitor. The corrosion inhibitor shall be water soluble oil or powder type and applied as recommended by the manufacturer.

1.05 Load Limits

A. Temporary Construction Loading

1. Pontoons E & P and Parts D & Q

- a. After the concrete in the roadway slab has attained a strength of 6000 psi, and the prestressing is complete, the top slab without cantilever slabs in place will support temporary construction loads equivalent to AASHTO H-10 loading or an equivalent uniform load of 200 pounds per square foot.

2. Pontoons A, B, C, Parts D & Q and Pontoon R

- a. After the concrete in the top slab of the pontoon has obtained a strength of 6000 psi and the prestressing is complete, the top slab will support temporary construction loads equivalent to AASHTO H-10 loading or an equivalent uniform load of 200 pounds per square foot.

3. Pontocns D & Q

- a. Not designed for any superimposed loads.

B. Final Loading

1. All Pontoons

- a. Final loading will be as shown in the plans.

Part 2 Materials

2.01 Concrete

A. Cement

1. Cement shall conform to the requirements for either Type II or Type III portland cement in accordance with AASHTO M 85. Type I cement will not be allowed.
 - a. C3A content to be eight percent maximum.
 - b. Alkali content $Na_2O + 0.658 K_2O$ less than 0.60 percent.
 - c. Cement factor 658 pounds per cubic yard minimum, 760 pounds per cubic yard maximum.

B. Admixtures

1. Water reducing admixture conforming to AASHTO Designation M 194, Type A shall be used in all Class PC concrete.
2. Super plasticizers meeting ASTM specifications may be used provided the Contractor can demonstrate ability to place and consolidate concrete before serious loss of slump occurs and insure that cold pour joints will be prevented.

C. Water

1. Water shall not contain more than 500 parts per million chloride as Cl nor more than 1000 parts per million of sulfates as SO₄.
 2. Water-cement ratio, shall be 0.40 maximum.
- D. Pozzolan addition, 10 percent minimum to 15 percent maximum of total cement content. Pozzolan Class N or F as per ASTM C 618, with calcium oxide limited to 10 percent and loss of ignition limited to five percent. The chemical requirements of Table 1A and the physical requirements of Table 2A are included.
- E. Air Entrainment
1. Air Entrainment shall not be used.
- F. Chlorides
1. The total soluble chlorides of the concrete mix shall not exceed 0.06% by weight of cement.

2.02 Reinforcing Steel

- A. Bars shall conform to the requirements of the plans and the standard specifications.

2.03 Rubber Seal

- A. Closed cell rubber sealing strip for the pontoons shall be as shown in the plans.
1. Rubber seal shall be general purpose synthetic or natural rubber having a minimum tensile stress of 1500 psi, a minimum elongation without breaking of 500 percent and shore durometer reading of 45 plus or minus.

2.04 Neoprene

- A. Neoprene shall be of durometer hardness and size called for in the plans.

2.05 Expanded Rubber

- A. The expanded rubber in the vertical joints shall conform to section 9-04.7 of the standard specifications and shall be bonded to the concrete with an approved waterproof cement.

2.06 Pontoon Ballast

- A. Pontoon ballast shall conform to the requirements of coarse aggregate, Grading No. 5, 1 inch maximum size, as specified in section 9-03.1(3)C of the standard specifications.
- B. The Contractor may use temporary ballast of potable water. Height of water used shall be as shown in the plans and subject to the approval of the Engineer.

2.07 Cable Saddle Assemblies

A. Cable Saddles

1. The cable saddles and bearing plates shall be of steel castings conforming to the requirements of ASTM designations A 27 Grade 70-36.
2. ASTM A 27 Supplementary provisions S1, S2, and S3, shall apply.
3. Castings shall be marked in accordance with ASTM A 27, Section 17.

B. Bearings

1. The polytetrafluorethylene (PTFE) self-lubricating element shall be composed of 100 percent virgin (unfilled) polytetrafluorethylene polymer bonded to a rigid confining sole plate. The sole plate shall limit the flow (elongation) of the confined PTFE to not more than .009 inch under a load of 2,000 psi for 15 minutes at 78 degrees F for a 2 inch x 3 inch test sample. The properties of the PTFE shall conform to the following requirements:

<u>Requirement</u>	<u>Test Method</u>	<u>Value</u>
Hardness at 78°F	ASTM D 2240	50-65 Durometer D.
Tensile Strength, psi	ASTM D 1457	2800 (Min. Avg.)
Elongation %	ASTM D 1457	200 (Min. Avg.)
Deformation Under Load % @ 78°F		
2,000 psi (1/2"x1/2"x3/32")	ASTM D 621	4 (Max.)
Specific Gravity	ASTM D 792	2.14 to 2.21

2. The stainless steel thickness shown in the plans shall meet AISI Type 304 (ASTM A 240) specifications and have a mirror finish of less than 10 micro-inches R.M.S. (Root-Mean-Square) on

the side in contact with the PTFE. The reverse side shall be welded to the bearing plate.

3. The sole plate shall conform to ASTM A 588 and the dimensions shall comply with the details as shown in the plans. All exposed surfaces shall be given a shop or prime coat of Red Lead Ready-Mix Paint conforming to State Standard Formula A-4-59.

2.08 Jacking Devices

A. Tensioning Rods, Nuts and Washers

1. Tensioning rods, nuts and washers shall conform to the requirements of ASTM Designation A 354 Grade BD.

B. Cable Crosshead Casting:

1. Material shall be of steel castings conforming to the requirements of ASTM A 486 Class 90.

C. Jacking Crosshead:

1. Jacking crosshead material shall conform to the requirements of ASTM A 588.

~~4~~ D. Hydraulic Jack:

1. Shall be industrial heavy duty type, having capacity and stroke as shown in the plans and as specified in these special provisions.

2.09 Chafing Ring

- A. All structural material shall conform to the requirements of ASTM A 27, Grade 70 - 36.

2.10 Cable Port and Port Lining

- A. All material shall be as shown and noted in the plans.

2.11 Epoxy Bonding Agent

- A. The epoxy bonding agent shall conform to the requirements of section 9-26 of the standard specifications.

2.12 Post Tensioning Tendons

- A. Bars shall conform to ASTM A 722, Type II or shall conform to ASTM A 722, Type I having a guaranteed minimum ultimate

tensile strength of 160,000 pounds per square inch and shall conform to the loads shown in the plans.

- B. Strand shall conform to ASTM A 416 Grade 270 and to the standard specifications as amended by these special provisions.

2.13 Post-Tensioning Anchorages

- A. Anchorage assemblies may be either rolled steel, forged steel or cast steel, provided the distribution plates are Bearing Type and not Wedge Type.

- 1. Bearing Type distribution plate transmits the force directly to the concrete in bearing without imparting a wedging or splitting force on the concrete.

2.14 Ducts.

- A. Post-Tensioning ducts shall be in accordance with section 6-02.3(26)C of the standard specifications, semi-rigid, water tight ducts, with a minimum thickness of 22 gage for rectangular ducts and 24 gage for round or oval ducts.

- 1. Ducts shall be galvanized in accordance with ASTM A 525-G90.

2.15 Pontoon Bolted Joint

- A. Bolts, Nuts and Washers

- 1. Bolts for joining pontoons "E" and "P" to existing first stage pontoons shall conform to the requirements of ASTM Designation A 449.
 - a. Nuts shall conform to the requirements of ASTM A 563, Grade C.
 - b. Washers shall be hardened washers conforming to the requirements of ASTM F 436.
 - c. Bearing plates shall conform to the requirements of ASTM A 572 or ASTM A 588.

- B. Flat Jacks - Pontoon Bolted Joints

- 1. Flat jacks used for alignment while joining pontoons "E" and "P" to existing first stage pontoons shall be Frescon Corporation, Reference No. 87 or equal.

2.16 Pontoon Prestressed Joints

A. Adjustable Wedges

Adjustable wedges used for alignment while joining pontoons A, B, C, D, E, and P, Q and R together shall conform to the requirements of ASTM A 36 or as may be approved by the Engineer.

2.17 Elastomeric Gaskets

A. Elastomeric gaskets shall conform to the physical property requirements for elastomeric bearings as set forth in Section 2.25.2 of the current AASHTO Standard Specifications for Highway Bridges.

1. The elastomeric portion of the elastomeric compound shall be 100 percent virgin chloroprene meeting the requirement of Table B.

2.18 Watertight Doors And Frames

A. Watertight doors shall be as shown in the plans.

B. Frames:

1. Channel frame assembly shall conform to the requirements of ASTM A 36.

2.19 Access Manhole Frames And Covers:

A. All structural steel material shall conform to the requirements of ASTM A 36.

B. All bolts including hook bolts shall conform to the requirements of ASTM A 325.

2.20 Catwalks And Ladders:

A. All structural steel shall conform to ASTM A 36.

2.21 Pump Hatch Frames And Covers: Shall conform to the requirements of ASTM A 48, Class 40C.

2.22 Vent Pipes:

A. Shall conform to the requirements of ASTM A 53 Grade B.

2.23 Bolts, Nuts And Washers

A. Bolts, nuts and washers shall conform to the requirements of ASTM A 325, unless otherwise specified.

B. Shear studs and inserts shall be as shown in the plans.

2.24 Bars, Plates And Shapes

A. Bars, plates and shapes shall conform to the requirements of ASTM A 36, unless otherwise noted.

2.25 Pontoon Cable Railing.

A. Cable railing shall be Phillystran 1/2 inch diameter HPTG, 20800 or equal. Color shall be grey.

B. Pipe for posts shall be standard steel pipe. ASTM A 53, Grade B. Bolts and nuts shall be stainless steel and conform to the requirements of ASTM F 593 Type 304.

C. Post tops and other required fittings shall be commercial quality steel hot dip galvanized in accordance with ASTM A 153. Post tops shall be watertight. The eye bolts shall be stainless steel ASTM A 276 Type 316.

D. Turnbuckles shall be commercial quality steel, and shall have jaw or eye ends as shown in the plans. Turnbuckles shall have 18,000 pounds minimum breaking strength and shall be hot dip galvanized in accordance with ASTM A 153.

Part 3 Construction Requirements

3.01 Concrete

A. Concrete Mix Design

1. Concrete Class PC shall meet all of the requirements of concrete Class AX except the material shall be proportioned to produce a concrete which shall have a minimum compressive strength of not less than 6000 pounds per square inch at the age of 28 days.

2. The Contractor shall design a mix that meets the specified strength requirements in conformance with ASTM Designation C 685. A coefficient of variation of 20 percent as indicated in Table 3, Strength Requirements, shall be assumed unless the supplier can demonstrate a record of sufficient test to justify the use of a lower coefficient in conformance with ASTM C 685.

3. The following items of ASTM C 685 are modified as follows:

Item 3: Basis of Purchase, shall be deleted and replaced by the applicable sections of the standard specifications.

Item 11: Failure to Meet Strength Requirements are modified to:

The quantity of material represented by a strength test shall be subject to the following payment adjustment, applied as a deduction from the unit price:

Payment adjustment per cubic yard = $0.005 (fc' - fc)$ (U.P.)

fc' = design strength of concrete

fc = Concrete strength at 28 days as determined by ASTM C 685

u.p. = On a lump sum basis, the unit price of concrete shall be taken as \$300.00 per cubic yard.

Item 14: Certifications. Sub-items 14.2.1 thru 14.2.8 shall apply.

4. Maximum allowable slump shall be 6 inches.

B. Admixtures

The mix used shall contain the minimum amount of water necessary for hydration and placement utilizing internal and external vibration. The water reducing additive to be used shall be as outlined in section 6-02.3(2)B of the standard specifications.

C. Low shrink concrete shall meet all the requirements of Class PC concrete except that the quantity of water shall be reduced so that the water/cement ratio shall not exceed 0.38 by weight. The minimum compressive strength shall be 6,000 pounds per square inch at the age of 28 days.

3.02 Formwork For Pontoon.

A. Forms shall be constructed and held during concrete placement in a substantial manner so that all portions of the structure conform to the design dimensions within the specified tolerances.

B. Any variation in wall or slab thicknesses will result in changing the computed position the completed pontoon will occupy in the water and may also result in dead load stresses in the completed structure which have not been provided for in the design.

1. The Contractor, therefore, will be required to exercise special care in this matter and to take such measures as may be acceptable to the Engineer to ensure conformance to the plans.
2. Forms may be constructed of either lumber, steel or a combination of the two, subject to review by the Engineer as to structural sufficiency.
3. If forms are made of lumber, the sheathing for the outside walls of the pontoons shall be faced with plywood.
4. Form sections which are to be reused shall be thoroughly cleaned of all concrete, sections with surface defects shall be replaced or repaired, and the form shall be recasted with an approved release agent before being used again.

C. Form Ties

1. Form tie assemblies for the pontoon shall be threaded rods or snap ties, and of a type which will leave no metal closer than 1 1/2 inches from exterior surfaces and 1 inch from interior surfaces.
 - a. In the event that snap ties are used, the spacing shall be half the conventional construction spacing in order to assure tolerances in concrete walls and slab.
2. Ties shall not be pull out type which can be completely removed from the concrete leaving a hole through the concrete.
3. The ties shall incorporate a waterstop. Twisted wire or hand iron ties will not be permitted.
4. The Contractor shall demonstrate, in the presence of the Engineer, the proposed method of tie and removal and patching prior to construction. Construction shall not proceed until the tie system and methods have been approved in writing by the Engineer.

- D. Side forms for walls shall be removed or loosened as approved by the Engineer before post-tensioning. The supporting floor shall be constructed in such a manner that the pontoon will be free to shorten during post-tensioning. A heavy coat of an approved bond breaker shall be applied to the flooring before placing concrete.
- E. After each launching, the dry dock, graving dock or shipways area used for pontoon fabrication shall be thoroughly washed, scraped and cleaned of all concrete and other foreign material adhering to the flooring as directed by the Engineer.
- F. All forms and debris shall be removed from the cells of the pontoons through the manholes. Stay in place forms are not permitted.
- G. The Contractor shall design his forms in accordance with section 6-02.3 of the standard specifications.
- H. Drilled-in Type anchors shall not be used in lieu of concrete inserts and bolts as shown and noted in the plans.

3.03 Constructing Prestressed Concrete Pontoons.

- A. The procedure contemplated in the construction of the floating structure is as follows:
 - 1. It is anticipated that the individual pontoon sections will be constructed at some location away from the site of the bridge and will then be floated into correct position at the site and attached to the adjacent sections and anchors. All of this work is to be performed in accordance with the plans and the following detailed specifications.
 - a. None of the pontoon units shall be moored to, or adjacent to the existing Bridge or phase I pontoons.
 - 2. The individual pontoon sections shall be so constructed that all concrete is placed and cured in the dry.
 - 3. It is the intent of these specifications that the pontoon section should be constructed in a graving dock, a floating drydock, or on shipways.
 - 4. None of these facilities will be provided by the State. It shall be the Contractor's sole responsibility to provide the casting and outfitting facilities required by this construction.

- B. Pier crossbeams and cantilever slabs shall be constructed or erected in Lake Washington. The Contractor is advised that the pontoons with the cantilever slab and the pier crossbeams in place will not pass through the Hiram Chittenden Locks.

3.04 DUCTS

A. Placing of Ducts.

1. The Contractor shall support and hold down the ducts. Spiral wound ducts which split at the seam(s) due to the application of fabrication and/or construction loads will not be permitted. Ducts shall prevent intrusion of cement paste and retain shape under the weight of concrete and other construction loads.
2. The ducts shall be handled and installed so as to prevent abrasion or contamination. All burrs shall be removed from ducts.
3. Ducts shall be positively sealed at all times before and after placing of tendons to prevent entry of water or foreign materials. For tendons with a sag, ducts shall be provided with drains.
4. End circular transition trumpets, oval to circular transition trumpets and splicers shall have the same material thickness as the duct.
 - a. Transition Trumpets shall not be assemblies of pieces of ducts.
5. Post-tensioned ducts for installation in closure pours shall be prebent to the radii shown in the plans.
 - a. Ducts that cannot be elastically bent to the desired configuration, shall have the bends fabricated.
 - b. At the Contractor's option, the trajectory change of rectangular ducts may be achieved by mitering, provided that angular change of miter is 5 degrees maximum, spacing of miter is 6 inches minimum at miter transition, and joint is leak-proof.
6. Splices shall be sleeved and taped with waterproof tape.

3.05 Tendon Grout

A. Grout Mix

1. The tendon grout shall be a mixture of portland cement and water with a maximum water cement ratio of 0.42.
2. The cement and water shall conform to the requirements of the standard specifications and article 2.01 of this section.

B. Admixtures

1. A water reducing admixture is required and the Contractor shall verify compatibility with the cement by test.
2. A retarding admixture may be used.
3. Expanding admixture or thixotropic admixtures are optional and are subject to Engineer's written approval following site demonstration test to verify compatibility, completeness of filling, and absence of bleed pockets.
4. Aluminum metal additives are not permitted except as part of an approved admixture such as Intraplast N.

C. Strength

1. The minimum 28 day compressive cube strength of the grout shall be 6,000 pounds per square inch.

3.06 Concrete Placement.

- A. Concrete shall be conveyed so as to prevent segregation, excessive evaporation, and heat loss or gain. In extreme weather this may require covered belts, or other protective measures as approved by the Engineer. Temperature of concrete during placement shall be between 40 and 80 degrees Fahrenheit.
- B. If concrete is to be delivered by pumping, the Contractor shall submit his complete plans for approval, showing his proposed equipment, including stand-by equipment, support of pumping lines, remixing facilities, if any, method of prevention of segregation and plugging, and control of slump, taking into account the absorption of water by the aggregates.

- C. Care shall be taken to insure against excess water entering the forms or mix during rains. If necessary, covers shall be provided over slabs.
- D. Placement of concrete in walls shall be such as to prevent segregation, taking into consideration the presence of numerous horizontal ducts, bars, and other obstructions.
- E. All concrete shall be uniformly and thoroughly vibrated but not to such an extent that segregation of the concrete mixture occurs.
 - 1. Portions of the structure requiring special attention are all corners of intersecting internal and external walls and bottom slabs.
 - 2. Proper openings shall be provided in the interior longitudinal and cross wall forms in order to guarantee proper and direct placing and vibration of the concrete in the walls below the openings.
 - 3. The type of vibration equipment and its method of use shall be subject to the approval of the Engineer.
 - 4. External vibration of the forms may be used if the forms are designed to withstand such service.
 - 5. Vibration shall be supplemented by hand tamping and spading where necessary to secure a smooth, dense concrete on the outside surfaces.
- F. Vibration of concrete shall comply with the requirements of section 6-02.3(9) of the standard specifications.
- G. The Contractor may use superplasticizers in accordance with the requirements of article 2.01.B.2 of this section.

3.07 Pontoon Repairs

A. Concrete

- 1. Any rock pockets or honeycomb shall be repaired by chipping out to sound concrete, cutting edges normal to the surface of the concrete 3/4 inch deep, coating with epoxy bonding agent, then placing concrete while epoxy is tacky and maintaining sufficient head of fresh concrete to prevent shrinkage.
- 2. Laminar, in-plane, cracks and planar patches greater than 50 square inches in size shall be reinforced across

the cracks or patch by drilled-in dowels, giving 0.3 percent steel area. The concrete surfaces shall be inspected for cracks in accordance with ASTM C 597.

3. Non-structural cracks - Less than 0.15 millimeters or 0.006 inches may be filled with a low viscosity high surface tension epoxy with a brush-on application.
4. Structural cracks - Crack widths greater than 0.006 inches are termed structural cracks, and may, at the discretion of the Engineer, be repaired by epoxy injection or may be cause for rejection of affected unit.
5. Products for repair are available from Sika, Adhesive Engineer; or equivalent. Products to be used must be approved by the Engineer.

B. Leakage In Pontoons

1. The attention of the Contractor is directed to the necessity of obtaining concrete of maximum density and the necessity of the completed work being watertight and without cracks or defects.
2. It is the intent of these specifications to describe a method of construction which will reduce the possibility of cracking to a minimum.
3. Should at any time leakage develop in the pontoons, the Contractor shall make such repairs as the Engineer may determine are necessary to correct the leaks. Such repairs shall be made at the Contractor's expense and to the satisfaction of the Engineer.
4. For the purpose of this contract, a leak shall be defined as any surface which shows increasing dampness after the pontoon has been floated for a period of 7 consecutive days or more.
5. The Contractor shall seal any such leaks from the outside with an underwater epoxy compound approved by the Engineer. If, however, a leak as described occurs at a visible crack, it shall be sealed by injection of epoxy from the inside by a means approved by the Engineer.
6. If leakage occurs which the Contractor cannot repair to the satisfaction of the Engineer, then such pontoon shall be subject to rejection by the Engineer and the

Contractor shall dispose of it any way he may determine and construct another unit in its place at his expense.

- C. The Contractor shall submit his proposal for concrete repairs and repair of leakage in pontoons to the engineer for approval.

3.08 Dimensions

- A. The lengths of the pontoons shown on the pontoon drawings are the final lengths after post-tensioning, and shall be increased as necessary to compensate for shortening due to prestressing and shrinkage.

3.09 Pontoon Prestressing.

- A. The Contractor shall furnish and place post-tensioning prestressing steel, metal ducts, anchorages, anchorage and distribution plates; tension the prestressing steel; and pressure grout the conduits in the structure as shown in the plans and in accordance with the standard specifications and these special provisions.

- B. Where the bars are connected by couplers, the connection shall be capable of developing a tensile strength of not less than the bar manufacturer's guaranteed minimum tensile strength of the bars.

C. Anchorages

1. Anchorage assemblies shall be as shown and detailed in the plans.

- a. Tendon bearing plate shall receive one shop coat of state primer A-6-61, zinc oxide primer.

D. Prestressing Operation

1. The Contractor shall jack and anchor the post-tensioning strands in the sequence shown in the plans. The tensioning of the post-tensioning strands or bars shall not commence until test on concrete cylinders, manufactured of the same concrete and cured under the same conditions as the pontoon concrete, indicate that all concrete has attained a minimum compressive strength of 4,500 pounds per square inch.
2. After being anchored, the post-tensioning strands shall be cut at least 1/2 inch from the face of the anchoring device.

3. Strands shall not be "flame" cut unless the strands are cut 1 inch or more from face of the anchoring device.
4. The anchorage assembly with projecting strands and bars and the sides of the anchorage recesses shall be coated with an epoxy bonding agent.
5. After coating the vertical and transverse tendon anchorage recesses with epoxy, a concrete mortar encasement shall be placed. Each cubic yard of mortar shall consist of 3/8 inch coarse aggregate, fine aggregate, 800 pounds of portland cement and a water-cement ratio not to exceed 0.42. The minimum concrete cover shall be 2 1/2 inches unless otherwise noted in the plans.

The mix shall have a minimum compression strength of not less than 6000 pounds per square inch at the age of 28 days.

E
D.

Grout and grouting procedures shall comply with section 6-02.3(26) F of the standard specifications. For vertical ducts, grouting shall comply with the written instructions of the post tensioning supplier. A field test grouting of a typical vertical tendon shall be conducted to verify complete filling of the duct. The Contractor's procedure in grouting shall be such as to positively displace all water in the ducts and to force grout through the tendons in the anchorage.

3.10 Curing Concrete.

- A. Curing of concrete shall comply with requirements of section 6-02.3(11) and 9-19.3(2) of the standard specifications and Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Precast Concrete Products, except as modified herein.
- B. Maintain the bottom and top cast-in-place pontoon slabs continuously wet with water for not less than ten days after concrete is placed.
- C. Maintain the formwork covering the interior and exterior wall surfaces continuously wet to prevent loss of moisture from the concrete. Under normal curing conditions the forms may be removed from the faces of the pontoon walls after three days.
 1. Within one hour after removal of forms, spray the inner concrete surfaces of the pontoons with an approved

chlorinated rubber Type 1 clear curing compound with a red fugitive dye added as specified in section 9-23.2 of the standard specifications designed for application on vertical surfaces. A second application shall be applied not sooner than eight hours nor later than 24 hours after first application.

2. Exterior cast-in-place concrete surfaces of the pontoon walls shall not be covered with curing compound but shall be kept wet with water until the pontoons have been prestressed, but for not less than ten days.

3. Care shall be taken to insure that exposed reinforcing steel and concrete surfaces to which closure pours will be bonded are kept free of curing compounds.

D. Precast components of the pontoon exterior shall be cured by keeping them continuously wet for not less than 10 days after the concrete is placed. Precast components of the pontoon interior may be cured as specified in article 3.10.C.1 of this section. The Contractor will be permitted to remove the forms for the precast components after the concrete has attained a minimum compressive strength of 4,500 psi.

E. In order to control the thermal strains in the concrete due to heat of hydration and subsequent cooling, the following is required:

1. Normally-cured concrete

a. The external surfaces of forms shall be insulated as necessary to prevent a thermal gradient through the walls of slabs, from center to edge, exceeding 27 degrees Fahrenheit or a rate of 36 degrees Fahrenheit per 24 hours. During this period, exposed surfaces such as slabs shall be similarly protected.

b. After forms are stripped, and during subsequent cure, protective tarpaulins or enclosures shall be provided to protect the concrete from rapid thermal changes or gradients for a period of seven days from time of placement, whenever the limitations specified above are exceeded.

2. Steam-cured members.

- a. The rate of cooling of the atmosphere inside steam hoods or chamber shall be limited to 20 degrees Fahrenheit per hour until temperature reaches 20 degrees Fahrenheit above ambient. At this stage, steam hoods may be removed and subsequent curing procedures carried out as provided above.
- b. Heat shall not be applied until three hours after placement of concrete.
- c. Protective tarpaulins or enclosures shall be provided to protect concrete from rapid thermal changes or gradients for a period of seven days from time of placement wherever the limitations specified above are exceeded.

3. The protective tarpaulins or enclosures referred to above shall be reasonably complete coverings of heavy canvas, rubber-impregnated nylon, multi-layered burlap or similar materials, so as to retain heat and restrict wind. They are not required to be airtight and may be spaced away from the member to facilitate curing or other work by the Contractor.

4. Thermally cured members

- a. If The Contractor elects to thermally cure the members, he may request the Engineer's approval to use thermal (dry heat) cure. The Contractor's request shall include test results correlating core samples taken from a test precast element with test cylinders cured in the same manner.
- b. Heat shall not be applied until three hours after placing of concrete.
- c. The exposed concrete surfaces shall be kept continuously moist throughout the curing period by use of an insulated cover, sealed at edges and enveloped with low pressure steam or fog spray. Moist atmosphere shall be maintained throughout the thermal curing period.
- d. Apply curing compound as noted in Article 3.11.C.1 of this section.

3.11 Finishing Concrete Surfaces

- A. After removal of the forms, repair defects as specified in section 6-02.3(14)B of the standard specifications.
- B. Form ties and bolts shall be removed to a depth of at least 1 inch from the concrete surface and the holes filled with grout as outlined for class 2 surface finish in section 6-02.3(14)B of the standard specifications. The grout shall be equal in strength to the pontoon concrete and shall form a watertight plug.
- C. The outside walls of pontoons, above one foot below the water line in the complete structure shall be given Class 2 surface finish and all other surfaces except top of top slab shall be given a Class 3 surface finish, all in accordance with sections 6-02.3(14)B and 6-02.3(14)C respectively of the standard specifications.
- D. Non-formed surfaces of precast sections shall have a steel trowel finish.
 - 1. Concrete in the top slabs of pontoons and in roadway slabs shall be placed, screeded to grade and floated in accordance with the sections of the standard specifications covering roadway slabs and as directed by the Engineer.
 - 2. The final finish of the roadway surface of the top slab shall be obtained by burlap drag as set forth in section 6-02.3(10) of the standard specifications for use when an asphalt concrete overlay is shown in the plans. The finished deck slab shall be free from any deviations exceeding 1/4 inch under a 10 foot straight edge placed parallel to the center line of the roadway.

3.12 Cast-In-Place Construction.

- A. The pontoon drawings, details and bar schedules have been prepared so that the pontoons may be constructed utilizing the maximum number of precast elements.
 - 1. The Contractor may propose that all or portions of the pontoon shall be constructed utilizing cast-in-place construction performed in the Contractor's dry dock, graving dock or shipway area used for pontoon fabrication.
 - a. For example the Contractor may elect to use precast interior diaphragms together with cast-in-place bottom slab, exterior walls and top slab.

- B. This type of construction will be referred to hereinafter as cast-in-place construction although the use of some precast elements as shown in the plans is recognized and permitted.
- C. The cast-in-place construction option shall produce pontoons to the same dimensions as those shown in the plans.
1. The pontoon shall contain the same prestressing tendons, including tendon anchorages.
 2. All other details and features such as hand rails, inserts, etc., shall not be changed.
 3. Waterstops shall be provided in any construction joint in the end bulkheads of a pontoon.
 4. Waterstops shall be 6 inches wide by 1/4 inch thick with 1/2 inch diameter bulb each end.
- D. The size and spacing of the reinforcing in the pontoons shall not be changed for cast-in-place construction. However, the details of the reinforcing shown in the plans for the joints between precast elements may be modified to suit cast-in-place construction as follows:
1. The configuration of the bar laps and the location of the splices may be changed.
 2. Wherever possible bar laps shall be staggered.
 3. Bar splices shall not be less than as indicated.
 4. Lap splices shall be tied at both ends.
 5. It is emphasized that these changes apply to the mild steel reinforcing and not to the post-tensioning.
- E. In order to minimize shrinkage, pours shall be staggered. The Contractor shall indicate his pour sequence on his working drawings.

F. Where cast-in-place construction is specifically shown in the pontoon drawings, construction joints will be permitted as follows:

1. Construction joints will be permitted, in general, at the intersection of members with the following exceptions:
 - a. Horizontal construction joints in the vertical exterior walls will only be permitted at base of top slab fillet and at top of bottom slab fillet.
 - b. Intermediate horizontal construction joints in the interior webs will be permitted at the Contractor's option.
2. Construction joints shall be perpendicular to the mild steel reinforcement crossing the joint.
3. Construction joints parallel to post-tensioning tendons shall clear the tendons by eight inches minimum.
4. All construction joints shall be as indicated on the Contractor's shop drawings and pour schedules required by article 1.03 C of this section.

G. At the Contractor's option, partial precast schemes may be used where cast-in-place construction is specifically shown in the pontoon drawings.

3.13 Construction Joints.

- A. The Contractor shall form joints using a roughened surface with 1/4 inch minimum roughness. Care shall be taken so that the bond of the large aggregate shall not be disturbed. Sand blasting or hydraulic-impulse water jet cutting shall be employed for concrete surfaces which have hardened.
- B. Prior to concreting against an existing pour, prepare the joint by cleaning and applying epoxy bonding agent following the recommendations of section 7.2.6 of the American Concrete Institute Committee Report 503, Use of Epoxy Compounds with Concrete except that the epoxy shall be applied by spray.
- C. The importance of thorough vibration of the concrete is emphasized and the Contractor shall use the highest degree of workmanship and quality control when making these joints.
- D. For horizontal joints in the walls of cast-in-place construction, a four to eight inch layer of the concrete mix

from which the coarse aggregate has been omitted shall be placed followed immediately by the ordinary concrete mix, with vibration extending through the first layer.

3.14 Rubber Seal at Pontoon Joints.

- A. The Contractor shall accurately set the rubber seal in position in the groove provided in the vertical joint and fasten to the concrete with stainless steel bolts ASTM F 593 Type 304 and adhesive as recommended by the manufacturer of the rubber seal.
 - 1. The continuous rubber seal shall form the seal against the entrance of water and escape of grout as the connections are being cleaned and grouted.
 - 2. Splices in the sealing strip shall be kept to a minimum with splices made by butting adjoining sections and cementing them together to form the continuous strip.
 - a. The Contractor shall accurately match the two abutting ends of the sealing strip to ensure maintenance of dimensions and shape at joints of jointing.
- B. The Contractor shall design and test the seal prior to installation. The seal shall be designed for a fluid pressure of 25 feet of concrete inside the joint or 25 feet or water outside the joint and shall accommodate dimensional tolerances of the joint.

3.15 Launching Pontoons

- A. Pontoons shall not be launched until completion of all concreting, post-tensioning, grouting; the grouting of all form tie holes; and final sealing of the prestressed anchor recesses.
 - 1. At launching, all grout in the post-tensioned ducts shall have a minimum compressive strength as indicated in the plans.
 - 2. Hatches shall be in place and sealed and all exterior wall openings, including joint ducts and sleeves, plugged or covered with watertight bulkheads prior to launching, and these plugs and bulkheads shall remain in place.
- B. Side or end launching of the pontoons on shipways will be acceptable only if the pontoons are blocked up on the ways so that the pontoon is maintained on a level keel as it enters

the water. End launching with the longitudinal axis of the pontoon parallel with the slope of the ways generates excessive stresses in the pontoons and is unacceptable.

- C. Other methods of launching the pontoons may be feasible and consideration will be given to any such methods provided the Contractor submits sufficient data and calculations as may be required to prove that his proposed method of launching will not overstress the pontoons.
- D. The Contractor shall provide all additional reinforcement and post-tensioning required for his method of launching.
- E. If a graving dock is used, the Contractor shall uniformly flood the dock, providing uniform water pressure below bottom slab.
- F. The estimated average drafts of the individual pontoons due to the pontoons dead loads only are:

<u>Pontoon</u>	<u>Draft in Feet</u>
A	14.5
B	12.2
C	12.3
D	14.5
E	11.2
P	11.2
Q	14.3
R	14.5

The estimated drafts are given herein only for the convenience of the Contractor. The State does not warrant, expressly or by implication, that these drafts will correspond to the actual drafts at the time of launching or flooding.

1. The Contractor shall verify the draft before column construction and shall make sure that the roadway grade elevations shown in the plans are met. These calculations shall be submitted to the Engineer for review prior to construction of columns.

3.16 Vertical Joints

- A. While still in the fabrication yard, the faces to be joined shall be roughened to a 1/4 inch depth. The concrete surface to which the expanded rubber is to be bonded need not be roughened.

B. The mating connections, double wedges and flat jacks shown in the plans provide for the final alignment of the pontoons.

1. It is the Contractor's responsibility to bring the pontoons together and to provide a means for holding the pontoons in approximate alignment until they are joined and secured.

C. It is anticipated that the Contractor will use bolts and neoprene pads to secure the pontoons while the flat jacks are being adjusted and temporary stressing tendons are being installed. The temporary stressing tendons establish a rigid connection between the adjacent pontoons, permitting grouting of the joint. The Contractor is responsible for the temporary tendons.

D. The pontoon surfaces which are to be joined including pontoons F and O of first stage construction shall be scraped clean of all marine growth and blasted clean to the satisfaction of the Engineer with a 1000 pounds per square inch pressure spray of potable water.

E. Prior to jointing pontoons, the Contractor may use a temporary ballast of potable water to achieve a vertical alignment of the pontoon sections. The Contractor shall submit to the Engineer for review details of his proposed ballasting scheme together with calculations to show that the pontoons will not be overstressed by the ballast.

F. After the two sections are brought together and temporary stressing tendons are activated, the joint shall be dewatered. The lower portion of the joint can be drained by removing a plug from a tendon or bolt hole and pumping out the water.

G. Once the two sections are temporarily joined and dewatered, the joint shall be flushed clean with a jet spray of potable water. If the Engineer judges the joint to be unclean, or not aligned, he may order the Contractor to separate the pontoons and repeat the joining procedures.

H. After cleaning the joint, the Contractor shall insert joint blockouts in tendon or bolt ducts, such as inflatable rubber hoses. These blockouts shall insure watertightness and proper alignment of the splice tendon ducts. The Contractor shall recheck the alignment and grout the joint. Grout shall be in accordance with section 3.78 Joint Grout of these special provisions.

1. During placement of the grout, the grout shall be vibrated with an internal pencil vibrator. After

placement but before final set, the top surface which has been altered by bleed, shall be removed and replaced with fresh grout, which shall be joined to the older grout by vibration. At the Contractor's option, he may form the joint several inches above the top slab, so that the bleed-damaged zone will be above the finished top deck; then strike it off after all bleeding has ceased.

3.17 Pontoon Bolted Joint

- A. The pontoon bolted joints are to join pontoons E and P to the existing first stage pontoons as shown and noted in the plans.
- B. The final working stress in the bolts at the bolted joints shall be as specified in the plans. In no case, during adjustment of the bolted joints, shall the stress in the bolt exceed the value shown in the plans.
- C. Bolt tension shall be determined by the torque required to turn the nut.
 - 1. Nuts shall be in motion at the time the torque is measured.
 - 2. Wrenches should be set to induce a maximum allowed bolt tension equaling the proof load shown in the plans as a percent of the ultimate bolt strength.
 - 3. Bolts shall be lubricated in the shop.
 - 4. Wrenches shall be calibrated by tensioning bolts of the required size and field conditions in a testing frame where the actual elongation of the bolt can be measured.
 - 5. Hydraulic tensioners may be used as an alternate for tensioning the bolts.
- D. Sufficiency of torque equipment and the calibration thereof shall be subject to approval of the Engineer.
- E. Preliminary samples of bolts shall be submitted for testing to determine the rate at which the bolts may be elongated while being tightened to their final stress condition in the joint.
 - 1. At least three bolts from each lot shall be sampled and tested.

- F. The method of shimming and tensioning the bolted joints shall be accomplished according to the sequence shown in the plans.
- G. Temporary duct plugs shall be installed in the 3 1/2 inch diameter standard pipe sleeves of the transverse bolted joints between pontoons E and P and the existing first stage pontoons as shown in the plans and as required during construction to prevent leakage of water into the pontoons.
- H. When the grout in the pontoon bolted joint has reached a compressive strength of 1500 psi or more, the bolts shall be tightened to their specified tension thus prestressing the joint.
- I. After tensioning the bolts for the bolted joints, the flat jacks in the joint shall be flushed clean and filled with grout.
 - 1. The grout shall be as specified in article 3.18 of this section.
- J. Grouting of the pipe sleeves shall be as outlined in article 3.05 of this section.
- K. The Contractor may start tensioning the bolts across the two bolted joints when the grout reaches the strength of 1500 pounds per square inch or more. No more than one half of the bolts shall be tensioned until the grout reaches a minimum compressive strength of 3500 pounds per square inch. No more than 75% of the bolts shall be tensioned until the grout reaches a minimum compressive strength of 5000 pounds per square inch, at which time the bolt tensioning shall be completed. The Contractor shall tension the bolts in accordance with the sequence shown in the plans and the reviewed and accepted shop drawing. Method of shimming and bolt tensioning shall be as indicated in the plans on sheet titled PRESTRESS & BOLTED JOINT DETAILS.

3.18 Pontoon Prestressed Joint

- A. The pontoon prestressed joints are to join pontoons A, B, C, D and E and pontoons P, Q and R together as shown and noted in the plans.
- B. For the pontoon-to-pontoon prestressed connections, the anchorages shall be encased as shown in the plans.
- C. The jacking sequence, the initial jacking forces and the final tendon stresses shall be as specified in the plans.

D. Temporary duct plugs shall be installed at the anchorage plate of the joint tendon of the pontoon prestressed joints as shown in the plans and as required during construction to prevent leakage of water into the pontoons.

E. Grouting of the ducts shall be as outlined in article 3.05 of this section.

F. After post-tensioning the tendons for the prestressed joints, the adjustable wedges shall be flushed clean and filled with grout.

1. The grout shall be as specified in article 3.18 of this section.

G. The Contractor may start post-tensioning the tendons across the prestressed joint when the grout reaches a minimum compressive strength of 3500 pounds per square inch. No more than one half of the tendons shall be post tensioned until the grout reaches a minimum compressive strength of 5,000 pounds per square inch, at which time the post-tensioning shall be completed. The Contractor shall post-tension the tendons in accordance with the sequence shown on the plans and the reviewed and accepted shop drawings.

3.19 Joint Grout

A. Joint grout shall conform to the following requirements:

1. Cement Type II or Type III - 800 pounds per cubic yard conforming to the requirements of article 2.01.A of this section
2. Coarse Aggregate - 3/8 inch maximum.
3. Sand to be at least 45 percent of total aggregate.
4. W/C Ratio - 0.42 maximum.
5. Water-reducing admixture either conventional or super-plasticizer.
6. No air entrainment.
7. Pozzolan up to - 100 pounds per cubic yard, (optional).
8. The minimum ultimate 28 day compressive strength of the grout shall be 6,000 pounds per square inch. The Contractor shall submit his mix design for the Engineer's review.

3.20 Pontoon Ballast

- A. The Contractor shall use gravel ballast to permanently ballast the pontoons into a desired freeboard adjustment as determined by the Engineer.
- B. In each cell which is to receive gravel ballast, the Contractor shall provide a 30 inch diameter perforated, galvanized, corrugated iron or steel pipe. The pipe shall project one foot above final ballast elevation. The pipe must withstand pressure and penetration of gravel ballast and shall extend to provide a means of measuring and removing any water that may collect therein. The pipe shall clear the catwalks and shall be placed away from fillets and in lower portions of end cells on all pontoons except A and R. In pontoons D, E, P and Q, the pipe shall be placed at the low end of the cells that have inclined bottom slabs.

3.21 Mooring Pontoons

A. Temporary Mooring

After launching and completing the pontoons, the Contractor may store some of the pontoons at a suitable temporary site. The Contractor shall submit plans for temporary anchoring of the pontoons to the Engineer for approval.

B. Mooring Pontoon R In Place

1. Mooring pontoon R in place will require disconnecting the longitudinal anchor cable L-5-N of the existing L.V. Murrow Floating Bridge adjacent to Pontoon R to avoid damaging the existing cables.
 - a. Anchor cable L-5-N shall not be reconnected until Pontoon R is anchored in place.
 - b. The Contractor shall make sure that the disconnected cable will clear all areas of operations during placing and anchoring Pontoon R.
2. If any damage to the existing cable does occur due to the Contractor's operations, such damage shall be repaired at the Contractor's expense and to the satisfaction of the Engineer.
3. Plans of the cable adjustment devices and port castings of the existing anchor cable installation will be available for the Contractor's inspection at the Project Engineer's Office.

- a. The Contractor shall field verify the actual location of the existing anchor cable.
4. The State will make available to the Contractor the hydraulic jacks, pumps and pullrods necessary for disconnecting and reconnecting the cable to the existing bridge while Pontoon R is moved into place.

3.22 Towing.

- A. The Contractor shall comply with all regulations of the United States Coast Guard affecting the movement of the pontoons.
- B. The Contractor shall provide fenders to protect the pontoons from damage during towing.
- C. The superstructure columns shall not be used for towing or mooring.
- D. When moving the pontoons by towing, the Contractor shall make his own determination of the seaworthiness of the pontoons for the towing conditions existing at the time of the movement.

3.23 Pump Hatch Frames And Covers

- A. The Contractor shall furnish and install the pump hatch frames and covers in the locations and to the dimensions shown in the plans. The hatches shall be capable of opening and closing from above utilizing the four bronze cap screws shown in the plans.
 1. When closed and locked, the hatch shall be water tight and shall sustain a minimum water pressure of 3 feet of head for one hour.
 - a. The Contractor shall perform all the necessary testing for water tightness for a random sample of at least 10 hatches to the satisfaction of the Engineer.
 - b. The Contractor shall place the pump hatch midway between the prestressed tendons. Tendon location may be adjusted slightly to provide 2 inch minimum clear to hatch frame. Reinforcing bars shall be bent to clear the hatch.
 - c. The Contractor shall place the pump hatch at the approximate middle of pontoon cells except as noted at corner cells and cells which have an inclined

bottom slab. Pump hatch location shall be compatible with the location of the 30 inch diameter pipe and shall clear catwalks.

3.24 Shear Connectors

- A. The Contractor shall furnish and install welded shear connectors in the number and to the dimensions noted in the plans and in accordance with the requirements of section 6-03 and 9-06.15 of the standard specifications.

3.25 Catwalks and Ladders

- A. The Contractor shall furnish and install ladders and steel grating walkways on structural steel supports for access to the interiors of the pontoons.
 - 1. All structural steel in the walkway gratings, supporting members, railings, ladders and connections shall be galvanized after fabrication in accordance with ASTM Designation A 123.

3.26 Access Manhole Frames and Covers

- A. The Contractor shall furnish and install the manhole frames and covers in the locations and to the dimensions shown in the plans. The manhole covers shall be opened and closed from above by a wrench engaging a central bolt as shown in the plans.
 - 1. When closed and locked, the cover shall be watertight and shall maintain a minimum water pressure of 3 feet of head for one hour.
 - a. The Contractor shall perform all the necessary testing for water tightness for a random sample of at least 4 manholes to the satisfaction of the Engineer.
- B. All metal parts shall be hot dip galvanized after fabrication in accordance with ASTM A 123.

3.27 Elastomeric Gaskets

- A. All gaskets shall be individually cast with fully molded edges.
 - 1. Corners and edges of molded gaskets may be rounded at the option of the Contractor.
 - 2. Radius at corners shall not exceed 3/8 inch, and radius of edges shall not exceed 1/8 inch.
 - 3. The durometer hardness shall be as noted in the plans.
- B. Gaskets shall be fastened to the manhole cover with an approved adhesive. Ends of gaskets which butt against other pieces such as in the manhole cover gasket shall not be rounded.

3.28 Cable Saddle Assemblies

- A. Cable Saddles
 - 1. The Contractor shall furnish and install the cable saddles as shown and noted in the plans.
 - 2. All patterns to be used in forming these castings shall become the property of the State and shall be securely boxed, labeled for storage and delivered to Washington State Department of Transportation, District 1, 10833 Northrup Way N.E., Bellevue, Washington, 98004, Attention: Maintenance Engineer.
 - 3. All patterns used in Stage 1 construction and stored by the State are available for the Contractor's use.
- B. Bearings
 - 1. The sole plates shall be well anchored. Special care shall be exercised at all times to insure protection of the stainless steel and PTFE surfaces from coming in contact with any foreign matter. As shown in the plans, the cable saddle and bearing plate shall be shop assembled into a completed unit prior to shipping to the job site.

3.29 Jacking Devices

- A. All exposed metal surfaces of the hydraulic cable adjustment equipment shall be painted in accordance with the section titled "PAINTING MISCELLANEOUS ITEMS" in these special provisions.
- B. Hydraulic jacks shall be of the center hole type and the ram and pump shall be separate units.
1. Each ram shall have a rated capacity of 100 tons but shall be capable of lifting 50 percent over rated capacity under test.
 - a. The ram shall have a center hole of 3 1/8 inch diameter and a usable travel of 7 inches.
 - b. The plunger shall have a hydraulic return.
 - c. The ram shall be designed to operate at a pressure of approximately 5000 psi at 100 tons loading.
- C. The pumps shall be hand-operated, two speed pumps with automatic changeover. They shall each come equipped with 12 feet of spring guarded high pressure hose, gauge adapters, shut-off valves and direction reading gauges with maximum reading indicator and shall be filled with hydraulic fluid of the proper grade. The gauge dial shall not be smaller than 3 1/2 inch diameter and shall be read directly in tons of force at the pull rod. All pumps shall be equipped with a three-way control valve (On-Neutral-Retract).
1. The Contractor shall procure two pumps in accordance with these specifications for anchor cable tensioning and adjustment. Pumps and accessories shall remain and become a part of the bridge operation equipment upon completion of the contract.
 2. The Contractor shall have pumps serviced, tested for calibration and certified serviceable prior to turning them over to the State.
 3. The Contractor shall exercise reasonable care in the use of the Jacking equipment and it shall be overhauled and put into first class operating condition following completion of the anchorage installation.
- D. The final position of the jacking crosshead shall be the longitudinal center of the jacking channels.

3.30 Overhead Rail System

- A. The Contractor shall install the overhead rail system in the pontoons as shown and noted in the plans.
- B. The overhead rail system shall be American Monorail, Tramrail Patent Track Co. or an approved equal.

3.32 Temporary Bridge Drain Lid

Soon after the completion of the top slab, the Contractor shall provide temporary water tight lids that will fit as a cover to the bridge drain. The water tight lids shall be bolted in place. The lid shall remain in place until the drain pipe is connected and in service.

3.33 Bridge Drains

- A. The Contractor shall furnish and install bridge drains and 12 inch corrugated metal pipe with treatment 2 in the locations and as shown in the plans.
- B. Bridge drain grates shall be galvanized in accordance with the applicable ASTM designation after fabrication.

3.34 Electrical Isolation

- A. Exposed embedments and their anchor bolts shall be electrically isolated from the reinforcing steel and all prestressing hardware by at least 1-1/2 inch concrete blocks, and plastic ties to hold anchor bolts.

3.35 Water Tight Door Frames

- A. The Contractor shall install the frames to the concrete openings with structural steel straps embedded in the concrete as shown and noted in the plans.
- B. The door frames shall be galvanized in accordance with ASTM A 123 after fabrication.

3.36 Watertight Doors

- A. The Contractor shall furnish and install watertight doors in accordance with the plans and these special provisions.
- B. Watertight doors shall be manufactured in accordance with the opening dimensions indicated in the plans.
- C. A sufficient number of double dogs shall be incorporated in the design to insure complete sealing and to allow operation

from each side of the door. Suitable padlock eyes and hasps shall be included to allow positive locking of the door.

- D. Gasket wedges shall be of neoprene. The door and its frame shall be fabricated from structural steel, the hinge pins shall be of such metal as to be of sufficient resistance to corrosion to insure proper operation of the door, and the remaining portions of the door such as the dogs, hinges, handles, gasket channels, jambs, etc., shall be of mild steel.
- E. The doors shall be provided with adequate neoprene gaskets to insure watertightness and so detailed that the doors may be easily opened or closed.
- F. After the doors have been installed, they shall receive three coats of Rustoleum, ATCO 2221, Carbon Elastic Paint or an approved equal.
- G. When the doors are closed and locked, they shall be watertight and shall sustain a minimum water pressure of 10 feet of head for one hour.
 - 1. The Contractor shall perform all the necessary testing for water tightness for a random sampling of at least 10 doors to the satisfaction of the Engineer.

3.38 Pontoon Cable Railing

- A. The Contractor shall furnish and install the pontoon cable railing, bolts, posts and other accessories as shown and noted in the plans and as specified in these special provisions.
- B. After welding, posts shall be hot-dip galvanized in conformance with the requirements of ASTM A 123.

3.39 Vent Pipes

- A. The Contractor shall furnish and install the vent pipes in the locations and as shown and noted in the plans.
- B. The vent pipes shall be galvanized after fabrication in accordance with ASTM A 123.

3.40 Chafing Rings and Port Linings

- A. The Contractor shall furnish and install the chafing rings and port linings in the locations and as shown and noted in the plans.

- B. The chafing rings and port linings shall be galvanized after fabrication in accordance with ASTM A 123.

3.41 Cable Port Covers

- A. The Contractor shall furnish and install the cable port covers in the locations and as shown and noted in the plans.

3.42 Blockouts

- A. Shear key recesses and blockouts shown in the plans shall have temporary water tight seals. The seals shall be securely attached and shall remain in place until permanent seals are installed.
- B. The utility blockouts in wall six of deck pontoons and in the interior transverse walls of pontoon B, C, D, E, P and Q and all interior walls of pontoons A and R shall be permanently sealed after installation of conduit.
- C. The Contractor shall verify the location of shear keys, rubber seals, bolts and other components of pontoons E and P that will mate with Stage 1 pontoons to assure a proper fit.

Part 4 Measurement

4.01 Units of Measurement

- A. Measurement for pontoons will be the number of pontoons furnished and completed.
- B. Measurement for pontoon ballast will be by the ton in place.
- C. Approximate Quantities - Pontoons

1. Pontoon A & R (Each Pontoon)

a.	Concrete Class PC	2,809 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.D. Ducts	14,446 L.F.
	(2) 3" x 1" O.E. Rectangular Duct	8,483 L.F.
	(3) 2" O.D. Round Duct	1,728 L.F.
	(4) 2" O.D. Duct for Bar Tendon	4,584 L.F.
	(5) 1-3/8" Ø Single Bar Tendon	4,757 L.F.
	(6) 0.6" Ø Prestressing Strand	225,584 L.F.
	(7) End Anchorage	
	19 Strand Tendon	100 Only
	4 Strand Tendon	280 Only
	Single Bar Tendon	346 Only

c.	Manufactured Items	
	(1) Watertight Doors and Frames	31 Only
	(2) Phillystran Cable	1,303 L.F.
	(3) Catwalk Grating	36,204 Lbs.
d.	Reinforcing Steel	698,000 Lbs
e.	Epcxy Coated Steel Reinforcing Bars	67,000 Lbs.
f.	Structural Carbon Steel	49,453 Lbs.
g.	Structural Low Alloy Steel	11,190 Lbs.
h.	Steel Castings	12,818 Lbs.
i.	Overhead Rail	245 L.F.
j.	Jacking Devices	4 Sets
2.	<u>Pontoon B:</u>	
a.	Concrete Class PC	4,393 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.D. Duct	30,798 L.F.
	(2) 3" x 1" O.D. Rect. Duct	23,171 L.F.
	(3) 2" O.D. Rectangular Duct	6,128 L.F.
	(4) 2" O.D. Duct for Bar Tendon	17,075 L.F.
	(5) 1-3/8" Ø Single Bar Tendon	17,759 L.F.
	(6) 0.6" Ø Prestressing Strand	658,036 L.F.
	(7) End Anchorage	
	19 Strand Tendon	158 Only
	4 Strand Tendon	810 Only
	Single Bar Tendon	1,440 Only
c.	Manufactured Items	
	(1) Watertight Door	29 Only
	(2) Phillystran Cable	2,071 L.F.
	(3) Catwalk Grating	38,034 Lbs.
d.	Steel Reinforcing Bars	984,000 Lbs.
e.	Epoxy Coated Steel Reinforcing Bars	106,700 Lbs.
f.	Structural Carbon Steel	59,622 Lbs.
g.	Structural Low Alloy Steel	5,595 Lbs.
h.	Steel Castings	4,219 Lbs.

i.	Overhead Rail	582 L.F.
j.	Jacking Devices	2 Sets
3.	<u>Fontoon C:</u>	
a.	Concrete	4,434 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.L. Duct	30,781 L.F.
	(2) 3" x 1" O.D. Rect. Duct	23,208 L.F.
	(3) 2" O.D. Round Duct	5,093 L.F.
	(4) 2" O.D. Duct for Bar Tendon	17,075 L.F.
	(5) 1-3/8" Ø Single Bar Tendon	17,759 L.F.
	(6) 0.6" Ø Prestressing Strand	656,297 L.F.
	(7) End Anchorage	
	19 Strand Tendon	158 Only
	4 Strand Tendon	778 Only
	Single Bar Tendon	1,440 Only
c.	Manufactured Items	
	(1) Watertight Door	29 Only
	(2) Phillystran Cable	2,015 L.F.
	(3) Catwalk Grating	38,034 Lbs.
d.	Reinforcing Steel Bars	958,100 Lbs.
e.	Epoxy Coated Steel Reinforcing Bars	106,700 Lbs.
f.	Structural Carbon Steel	59,452 Lbs.
g.	Structural Low Alloy Steel	5,595 Lbs.
h.	Steel Castings	4,219 Lbs.
i.	Overhead Rails	582 L.F.
j.	Jacking Devices	2 Sets
4.	<u>Fontoon D:</u>	
a.	Concrete Class PC	5,103 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.D. Duct	30,480 L.F.
	(2) 3" x 1" O.L. Rect. Duct	33,561 L.F.
	(3) 2" O.D. Round Duct	4,220 L.F.
	(4) 2" O.D. Duct for Bar Tendon	19,893 L.F.
	(5) 1-3/8" Ø Single Bar Tendon	20,665 L.F.

(6)	0.6" Ø Prestressing Strand	692,047 L.F.
(7)	End Anchorage	
	19 Strand Tendon	158 Only
	4 Strand Tendon	908 Only
	Single Bar Tendon	1,552 Only
c.	Manufactured Items	
	(1) Watertight Door	31 Only
	(2) Phillystran Cable	507 L.F.
	(3) Catwalk Grating	38,034 Lbs.
d.	Steel Reinforcing Bars	1,088,000 Lbs.
e.	Epoxy Coated Steel Reinforcing Bars	153,000 Lbs.
f.	Structural Carbon Steel	59,552 Lbs.
g.	Structural Low Alloy Steel	5,595 Lbs.
h.	Steel Castings	4,219 Lbs.
i.	Overhead Rails	565 L.F.
j.	Jacking Devices	2 Sets
5.	<u>Pontoon E:</u>	
a.	Concrete Class PC	4,110 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.L. Duct	22,892 L.F.
	(2) 3" x 1" O.D. Rect. Duct	33,794 L.F.
	(3) 2" O.D. Round Duct	3,492 L.F.
	(4) 2" O.D. Duct for Bar Tendon	14,756 L.F.
	(5) 1-3/8" Ø Single Bar Tendon	15,585 L.F.
	(6) 0.6" Ø Prestressing Strand	575,352 L.F.
	(7) End Anchorage	
	19 Strand Tendon	124 Only
	4 Strand Tendon	856 Only
	Single Bar Tendon	1,492 Only
c.	Manufactured Items	
	(1) Watertight Door	31 Only
	(2) Catwalk Grating	38,034 Lbs.
d.	Steel Reinforcing Bars	940,000 Lbs.
e.	Epoxy Coated Steel Reinforcing Bars	177,800 Lbs.

f.	Structural Carbon Steel	54,302 Lbs.
g.	Structural Low Alloy Steel	5,595 Lbs.
h.	Steel Castings	4,219 Lbs.
i.	Overhead Rails	561 L.F.
i.	Jacking Devices	2 Sets
6.	<u>Pontoon P:</u>	
a.	Concrete Class PC	4,094 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.D. Duct	22,892 L.F.
	(2) 3" x 1" O.L. Rect. Duct	33,918 L.F.
	(3) 2" O.D. Round Duct	3,706 L.F.
	(4) 2" O.D. Duct for Bar Tendon	14,130 L.F.
	(5) 1-3/8" Ø Single Bar Tendon	14,889 L.F.
	(6) 0.6" Ø Prestressing Strand	575,705 L.F.
	(7) End Anchorage	
	19 Strand Tendon	124 Only
	4 Strand Tendon	872 Only
	Single Bar Tendon	1,484 Only
c.	Manufactured Items	
	(1) Watertight Door	32 Only
	(2) Catwalk Grating	34,427 Lbs.
d.	Reinforcing Steel	933,000 Lbs.
e.	Epoxy Coated Steel Reinforcing Bars	102,000 Lbs.
f.	Structural Carbon Steel	55,399 Lbs.
g.	Structural Low Alloy Steel	5,595 Lbs.
h.	Steel Castings	4,219 Lbs.
i.	Overhead Rails	492 L.F.
i.	Jacking Devices	2 Sets
7.	<u>Pontoon Q</u>	
a.	Concrete Class PC	5,103 C.Y.
b.	Post-Tensioning	
	(1) 4-5/16" O.L. Duct	30,459 L.F.

(2)	3" x 1" O.D. Rect. Duct	33,547 L.F.
(3)	2" O.D. Round Duct	4,144 L.F.
(4)	2" O.D. Duct	19,218 L.F.
(5)	1-3/8" Ø Single Bar Tendon	19,981 L.F.
(6)	0.6" Ø Prestressing Strand	692,581 L.F.
(7)	End Anchorage	
	19 Strand Tendon	158 Only
	4 Strand Tendon	924 Only
	Single Bar Tendon	1,552 Only
c.	Manufactured Items	
	(1) Watertight Door	31 Only
	(2) Phillystran Cable	507 L.F.
	(3) Catwalk Grating	35,209 Lbs.
d.	Steel Reinforcing Bars	1,069,000 Lbs.
e.	Epoxy Coated Steel Reinforcing Bars	153,000 Lbs.
f.	Structural Carbon Steel	59,932 Lbs.
g.	Structural Low Alloy Steel	5,595 Lbs.
h.	Steel Castings	4,219 Lbs.
i.	Overhead Rails	478 L.F.
j.	Jacking Devices	2 Sets

D. Approximate Quantities - Pontoon to Pontoon Connections

1. Vertical Joints

a.	Pontoon A-E & Q-R (Each Joint)	
	(1) Grout	310 C.F.
	(2) 0.6" Ø Prestressing Strand	147,315 L.F.
	(3) End Anchorage (19 Str. Tendon)	160 Only
	(4) 3" x 3-1/2" Rubber Seal	124 L.F.
	(5) 1/4" Expanded Rubber Sheet	1,224 S.F.
	(6) Adjustable Wedges	4 Only
b.	Pontoon B-C & C-D (Each joint)	
	(1) Grout	310 C.F.
	(2) 0.6" Ø Prestressing Strand	78,654 L.F.
	(3) End Anchorage (19 Str. Tendon)	160 Only
	(4) 3" x 3-1/2" Rubber Seal	124 L.F.
	(5) 1/4" Expanded Rubber Sheet	1,221 S.F.
	(6) Adjustable Wedges	4 Only
c.	Pontoon D-E	

(1) Grout	274 C.F.
(2) 0.6" Ø Prestressing Strand	62,491 L.F.
(3) End Anchorage (19 Str. Tendon)	124 Only
(4) 3" x 3-1/2" Rubber Seal	120 L.F.
(5) 1/4" Expanded Rubber Sheet	1,094 S.F.
(6) Adjustable Wedges	4 Only

d. Pontoon P-Q

(1) Grout	253 C.F.
(2) 0.6" Ø Prestressing Strand	62,489 L.F.
(3) End Anchorage (19 Strand Tendon)	124 Only
(4) 3" x 3-1/2" Rubber Seal	116 L.F.
(5) 1/4" Expanded Rubber Sheet	987 S.F.
(6) Adjustable Wedges	4 Only

e. Pontoon E-F & O-P (Each Joint)

(1) Grout	194 C.F.
(2) 2 1/4" Ø ASTM A449 H.S. Bolts	22,580 Lbs.
(3) Structural Carbon Steel	14,615 Lbs.
(4) 10" Ø Circ. Rubber Seal	114 Only
(5) 3" x 4" Rubber Seal	106 L.F.
(6) Flat Jack	8 Only
(7) Structural Low Alloy Steel	8,143 Lbs.

F. The quantities are listed herein only for the convenience of the Contractor and are not guaranteed to be complete or accurate. The prospective bidders shall verify these quantities before submitting a bid. No adjustments other than for approved changes will be made in the unit contract price(s) even though the actual quantities required may deviate from those listed.

PART 5 Payment

5.01 Basis of Payment

A. Payment will be made for such of the following listed bid items as are included in the proposal, and payment will be made under:

1. "Furnish Pontoon A", per each
2. "Furnish Pontoon B", per each
3. "Furnish Pontoon C", per each
4. "Furnish Pontoon D", per each
5. "Furnish Pontoon E", per each
6. "Furnish Pontoon P", per each